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(71) Applicant
Mitsubishi Chemical Industries Limited (Japan),
5-2 Marunouchi 2-chome, Chiyoda-ku, Tokyo, Japan

(72) Inventors
Toshio Niwa,
Yukichi Murata,
Shuichi Maeda

(74) Agent and/or Address for Service
Langner Parry,
52-54 High Holborn, London WC1V 6RR

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B41M 5/28

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(56) Documents cited
GB 1278325 GB 0973028
GB 1275067 EP A1 0097493
GB 1191460

(58) Field of search
G2C

(54) Transfer recording method

(57) The transfer recording method which comprises heating a transfer sheet having a color material layer containing a sublimable dye on a base according to the image information received, thereby subliming said sublimable dye and transfer recording it on an image receiving layer of a recording sheet, a transfer recording method which is characterized by that the image receiving layer of the recording sheet contains a compound capable of reacting with the sublimable dye contained in the color material layer of the transfer sheet.

Formulae in the printed specification were reproduced from drawings submitted after the date of filing, in accordance with Rule 20(14) of the Patents Rules 1982.

GB 2 159 971 A

SPECIFICATION

Transfer recording method

5 This invention relates to a transfer recording method.

In office automation terminal such as facsimiles, printers, copying machines etc. which have lately been rapidly spread, there has been an increasing demand for color recording having a capacity for a great amount of information and also being visually preferable. On the other hand, the development of techniques of color recording of television images has been sought.

10 Currently, for these purposes, color recording techniques by electron photography, an ink-jet process, a heat-sensitive transfer process etc. are being under study.

Of those, the heat-sensitive transfer process is more advantageous as compared with the other processes since the maintenance and operation of the device are easier and the device and expendable supplies are less expensive.

15 The heat-sensitive transfer process may be classified into two, namely, a molten transfer process which comprises heat melting a dye layer formed on a base using a heat-sensitive head, thereby transfer recording on a recording sheet, and a sublimation transfer process which comprises forming a dye layer containing a sublimable dye on a base and heating it by a heat-sensitive head, thereby subliming the dye and transfer recording on a recording sheet, and the latter is believed particularly advantageous for full color recording, because gradation recording is easy since it is possible to control the amount of the dye to be sublimed and transferred by controlling the energy applied to the heat-sensitive head.

The dye for use in the above-described sublimation transfer process is desirably a dye as much sublimable as possible in order to reduce the burden on the heat-sensitive head or to increase the recording speed, but such an easily sublimable dye, during a long-term storage period or under high-temperature, high-moisture environment, had a problem with the recording stability, because the dye re-sublimed from the recording sheet and hence deteriorated the recording and migrated to contacted objects thus staining them.

As a method for solving such a problem, it is contemplated to prevent the re-sublimation by laminating the surface of the recording sheet with a resin film after transfer recording.

However, in such a method, since it necessary to use a material and a device for laminating and also the device assembly itself becomes larger and more complicated, further improvement is being desired.

Accordingly, it is an object of this invention to provide a method for obtaining a transfer recording having excellent storage stability.

According to the invention there is provided a transfer recording system which comprises a transfer sheet having a color material layer containing a sublimable dye on a base which on heating according to image information received said sublimable dye is sublimed and transfer recorded on an image receiving layer of a recording sheet which image receiving layer contains a compound capable of reacting with the sublimable dye contained in the color material layer of the transfer sheet.

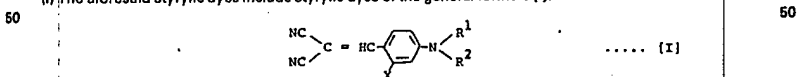
The transfer sheet used in the transfer recording method of this invention may be obtained by mixing a sublimable dye with an appropriate resin and solvent, water etc. to prepare an ink, coating said ink on an appropriate base and then drying thereby forming a color material layer.

The sublimable dye used in this invention may be selected from a wide variety of sublimable dyes usually used for sublimation type heat-sensitive transfer recording, and examples thereof are described in detail:

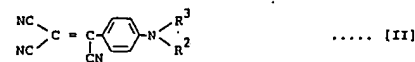
[A] *Sublimable dyes capable of reacting with an epoxy group or an isocyanate group:*

45 The following dyes fall in this category: styrylic, indoaniline type, naphthoquinone type, azo type, anthraquinone type, nitro type, quinophthalone type, methine type and the like sublimable dyes having such groups as amino group, alkylamino group, hydroxyl group, carboxyl group, amido group, mercapto group etc. That is:-

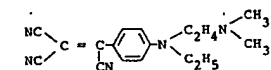
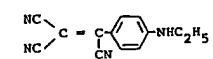
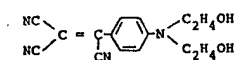
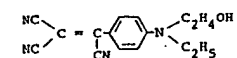
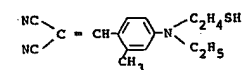
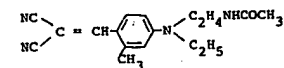
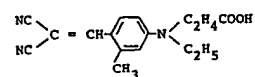
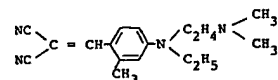
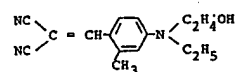
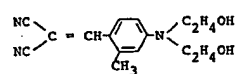
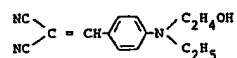
(i) The aforesaid styrylic dyes include styrylic dyes of the general formula (I):



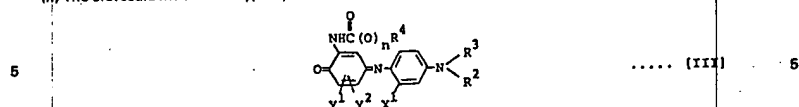
55 wherein X is hydrogen or methyl, R¹ is hydroxyalkyl, dialkylaminoalkyl, hydroxycarbonylalkyl, acylaminoalkyl or mercaptoalkyl, and R² is alkyl or hydroxyalkyl, and styrylic dyes of the general formula (II):



wherein R^3 is hydrogen, hydroxyalkyl or dialkylaminoalkyl, and R^4 is as defined above.
Examples of preferred styrylic dyes are those of the following structural formulae:

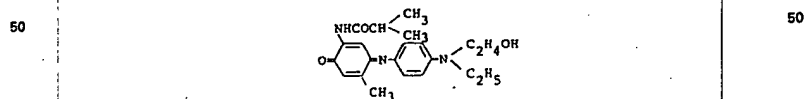
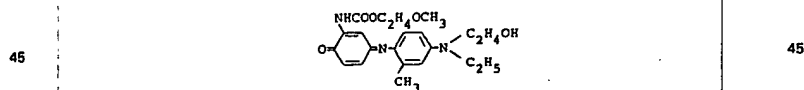
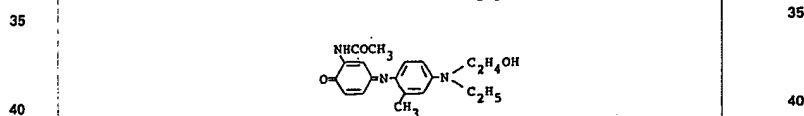
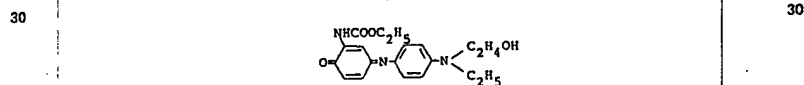
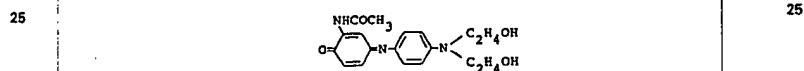
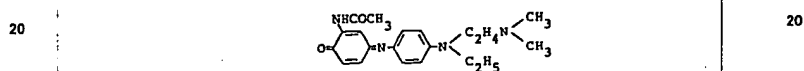
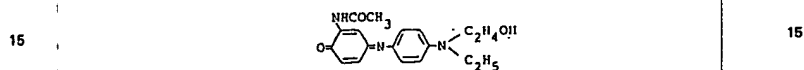


(ii) The aforesaid indoaniline type dyes include indoaniline type dyes of the general formula (III):



10 wherein n is 0 or 1, R⁴ is alkyl or alkoxyalkyl, Y¹, Y² and X¹ are each hydrogen, methyl, methoxy, halogen, acylamino or alkoxycarbonylamino, and R² and R³ are as defined above.

Examples of preferred indoaniline type dyes are those of the following structural formulae:

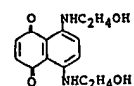


55 (iii) The aforesaid naphthoquinone type dyes include naphthoquinone type dyes of the general formula (IV):



wherein R^5 is hydrogen, hydroxyalkyl or dialkylaminoalkyl, and R^6 is hydrogen, alkyl, hydroxyalkyl or dialkylaminoalkyl, and a naphthoquinone type dye of the structural formula:

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10 Examples of preferred naphthoquinone dyes are those of the following structural formulae:

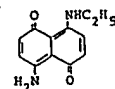
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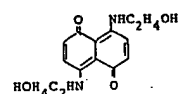
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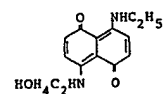
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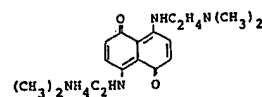
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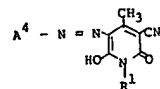
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(iv) The aforesaid azo type dyes include azo type dyes of the general formula [XXXI]:

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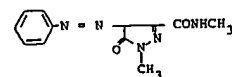
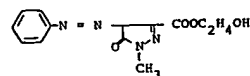


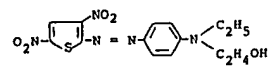
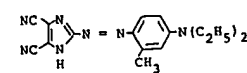
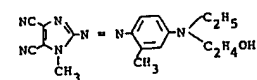
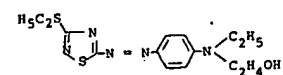
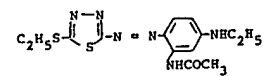
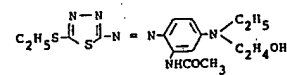
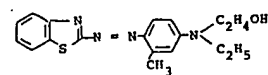
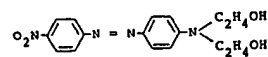
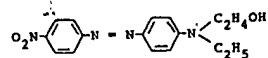
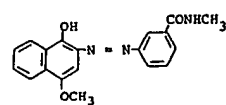
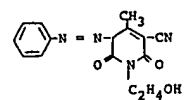
..... [XXXI]

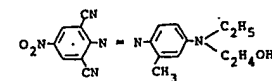
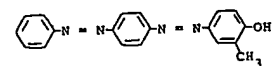
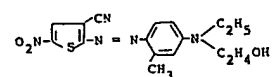
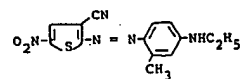
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wherein A^4 is optionally substituted phenyl, and R^1 is as defined above, and azo type dyes of the following structural formulae:

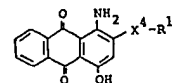
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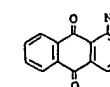
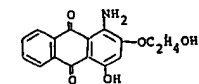
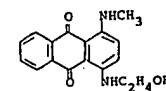
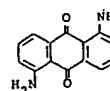
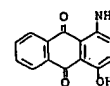




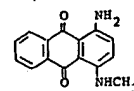
(v) The aforesaid anthraquinone type dyes include anthraquinone type dyes of the general formula [XXXII]:



wherein X^4 is $-\text{O}-$ or $-\text{S}-$, and R^1 is as defined above, and anthraquinone type dyes of the following structural formulae:

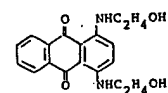


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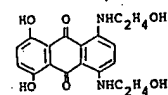
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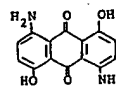
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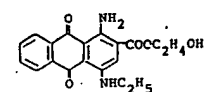
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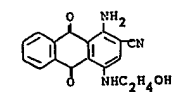
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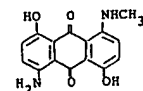
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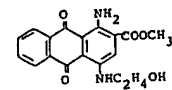
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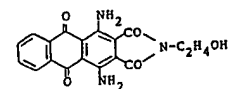
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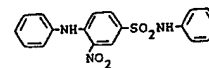


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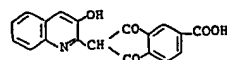
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(vi) The aforesaid nitro type dyes include a nitro type dye of the following structural formula:



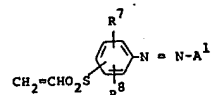
(vii) The aforesaid quinophthalone type dyes include a quinophthalone type dye of the following structural formula:



(B) Sublimable dyes having a vinylsulfone group:

The following dyes fall in this category: azo type, anthraquinone type, nitro type, naphthoquinone type, quinophthalone type and the like sublimable dyes having a vinylsulfone group. That is:-

(i) The aforesaid azo type dyes include azo type dyes of the general formula [V]:



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..... [V]

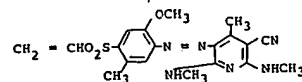
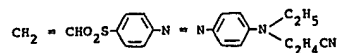
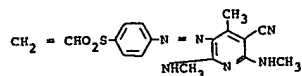
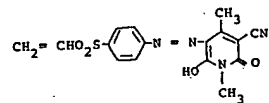
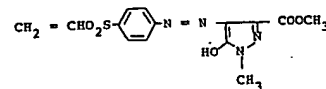
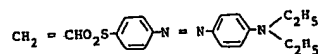
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wherein A¹ is optionally substituted aminophenyl, pyrazolone, pyridone or pyridinyl, and R⁷ and R⁸ are each hydrogen, alkyl or alkoxy.

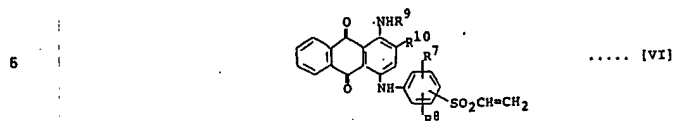
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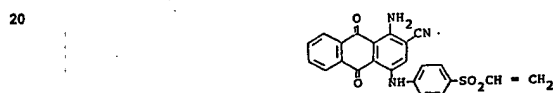
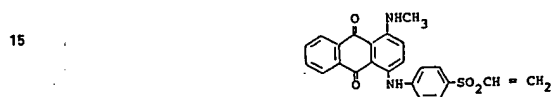
Examples of preferred azo type dyes are those of the following structural formulae:



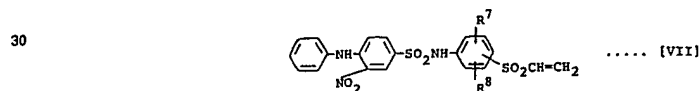
(ii) The aforesaid anthraquinone type dyes include anthraquinone type dyes of the general formula [VI]:



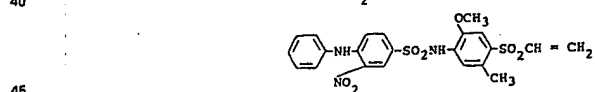
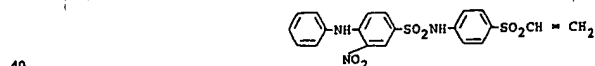
10 wherein R⁹ is hydrogen or alkyl, R¹⁰ is hydrogen or cyano, and R⁷ and R⁸ are as defined above.
Examples of preferred anthraquinone type dyes are those of the following structural formulae:



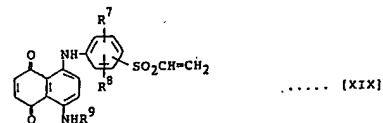
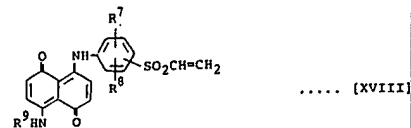
(iii) The aforesaid nitro type dyes include nitro type dyes of the general formula [VII]:



35 wherein R⁷ and R⁸ are as defined above.
Examples of preferred nitro type dyes are those of the following structural formulae:

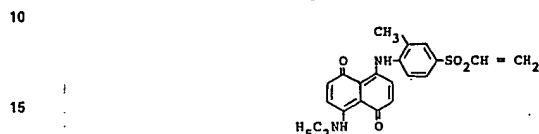
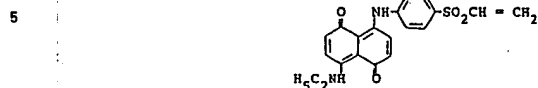


(iv) The aforesaid naphthoquinone type dyes include naphthoquinone type dyes of the general formula [XVIII] or [XIX]:

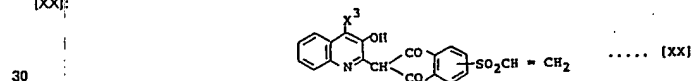


wherein R^7 , R^8 and R^9 are as defined above.

Examples of preferred naphthoquinone type dyes are those of the following structural formulae:

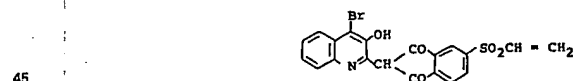
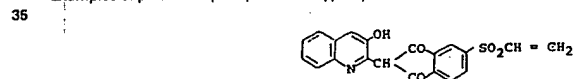


25 (v) The aforesaid quinophthalone type dyes include quinophthalone type dyes of the general formula [XX]:



wherein X^3 is hydrogen or halogen.

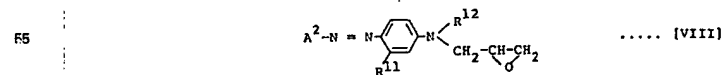
Examples of preferred quinophthalone type dyes are those of the following structural formulae:



[C] *Sublimable dyes having an epoxy group:*

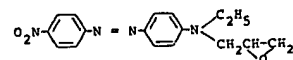
The following dyes fall in this category: azo type, anthraquinone type, naphthoquinone type, styrylic, indaniline type, quinophthalone type, azomethine type and the like sublimable dyes having an epoxy group. That is:-

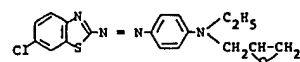
(i) The aforesaid azo type dyes include azo type dyes of the general formula [VIII]:



wherein A^2 is optionally substituted phenyl, benzothiazolyl, imidazolyl or thienyl, R^{11} is hydrogen, alkyl or 60 alkylcarbonylamino, and R^{12} is alkyl.

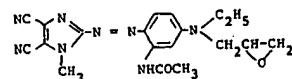
Examples of preferred azo type dyes are those of the following structural formulae:





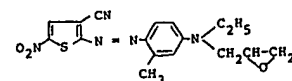
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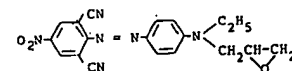
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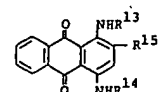
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(ii) The aforesaid anthraquinone type dyes include anthraquinone type dyes of the general formula [IX] or [X]:

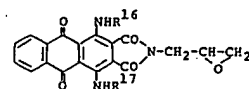
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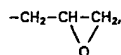
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wherein R^{13} and R^{14} are each hydrogen, alkyl or

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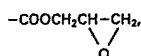
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R^{15} is hydrogen or

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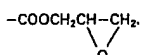
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and R^{16} and R^{17} are each hydrogen or alkyl, with the proviso that when R^{13} and R^{14} are both hydrogen or alkyl, the R^{15} is

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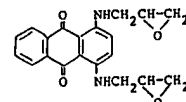
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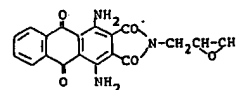
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Examples of preferred anthraquinone type dyes are those of the following structural formulae:

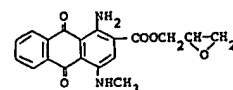


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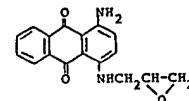
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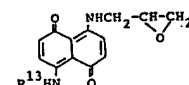
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20 (ii) The aforesaid naphthoquinone type dyes include naphthoquinone type dyes of the general formula [XI] or [XXI]: 20

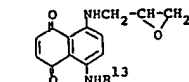
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..... [XI]

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..... [XXI]

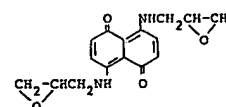
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wherein R¹³ is as defined above.

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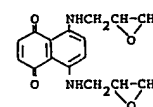
Examples of preferred naphthoquinone type dyes are those of the following structural formulae:

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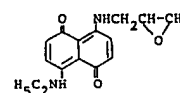
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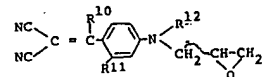


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(iv) The aforesaid styrylic dyes include styrylic dyes of the general formula [XII]:

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..... [XII]

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wherein R¹⁰, R¹¹ and R¹² are as defined above.

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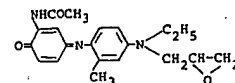
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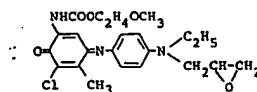
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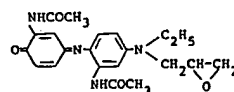


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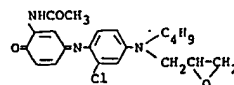
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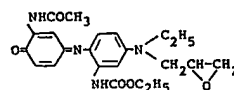
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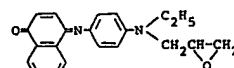
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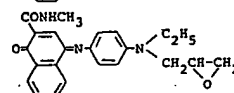
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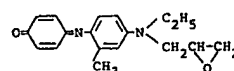
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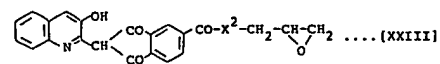
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(vi) the aforesaid quinophthalone type dyes include quinophthalone type dyes of the general formula
40 [XXIII]:

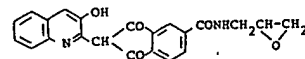
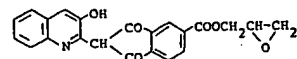


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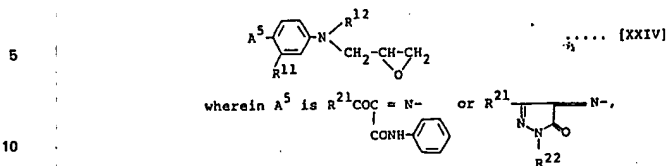
45 wherein -X²- is -O- or -NH-.

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Examples of preferred quinophthalone type dyes are those of the following structural formulae:

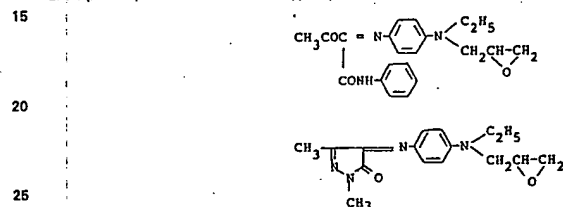


(vi) The aforesaid azomethine type dyes include azomethine type dyes of the general formula [XXIV]:



R²¹ and R²² are each alkyl, and R¹¹ and R¹² are as defined above.

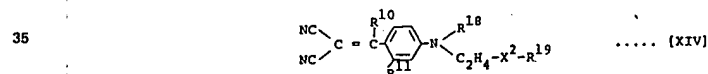
Examples of preferred azomethine type dyes are those of the following structural formulae:



[D] Sublimable dyes having an acryloyl group or a methacryloyl group.

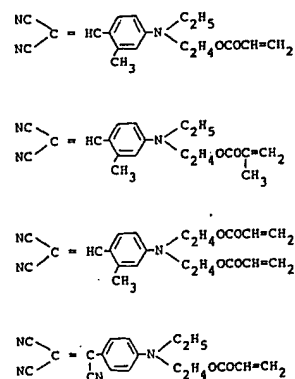
The following dyes fall in this category: styrylic, indoaniline type, azo type, anthraquinone type, naphthoquinone type, azomethine type and the like sublimable dyes having an acryloyl group or a methacryloyl group. That is:-

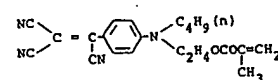
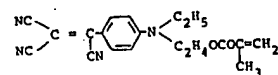
(i) The aforesaid styrylic dyes include styrylic dyes of the general formula [XIV]:



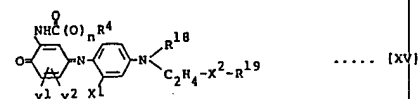
wherein R¹⁰ is alkyl, R¹¹ is acryloyl or methacryloyl, and R¹⁰, R¹¹ and R¹⁹ are as defined above.

40 Examples of preferred styrylic dyes are those of the following structural formulae:

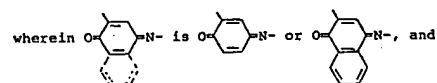
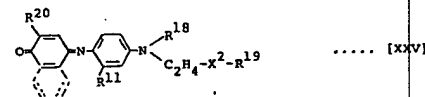




(ii) The aforesaid indoaniline type dyes include indoaniline type dyes of the general formula (XV):

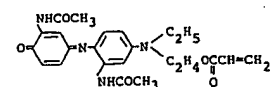
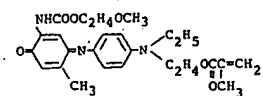
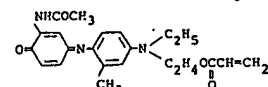
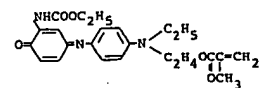
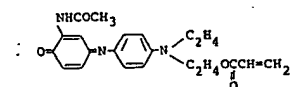


wherein n , R^4 , R^{18} , R^{19} , Y^1 , Y^2 , X^1 and X^2 are as defined above, and indoaniline type dyes of the general formula [XXV]:

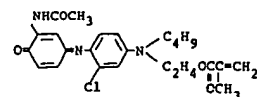


35 R^{11} , R^{18} , R^{19} , R^{20} and X^2 are as defined above.

Examples of preferred indoaniline type dyes are those of the following structural formulae:

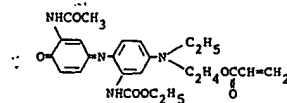


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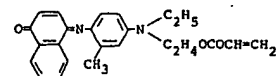
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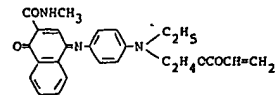
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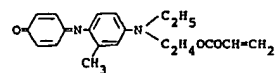
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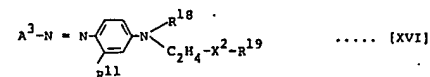
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30 (ii) The aforesaid azo type dyes include azo type dyes of the general formula [XVI]:

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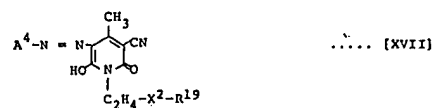
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wherein A^3 is optionally substituted phenyl, thienyl or thiadiazolyl, and R^{11} , R^{18} , R^{19} and X^2 are as defined above, and azo type dyes of the general formula [XVII]:

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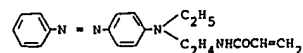
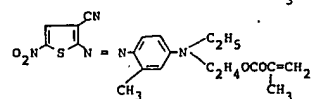
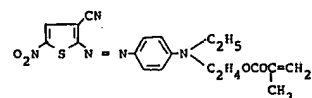
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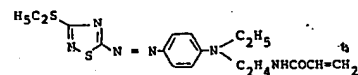
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wherein A^4 is optionally substituted phenyl, and R^{18} and X^2 are as defined above.
Examples of preferred azo type dyes are those of the following structural formulae:

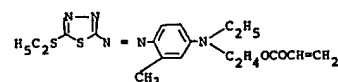


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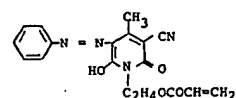
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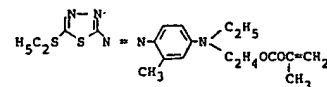
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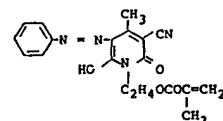
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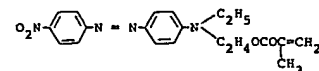
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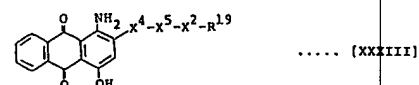
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(iv) The aforesaid anthraquinone type dyes include anthraquinone type dyes of the general formula [XXIII]:

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wherein X⁵ is alkylene, and X², X⁴ and R¹⁹ are as defined above, and anthraquinone dyes of the general formula [XXVI]:

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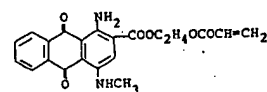
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55 wherein R²³ is hydrogen or -COO-C₂H₄-X²-R¹⁹, and R⁹, R¹⁸ and X² are as defined above, with the proviso that when R¹⁸ is alkyl, then R²³ is -COO-C₂H₄-X²-R¹⁹.

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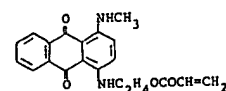
Examples of preferred anthraquinone type dyes are those of the following structural formulae:

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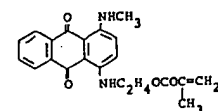
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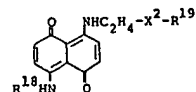


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(v) The aforesaid naphthoquinone type dyes include naphthoquinone type dyes of the general formula [XXVIII] or [XXIX]:

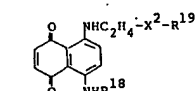
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..... [XXVIII]

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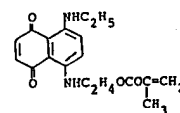
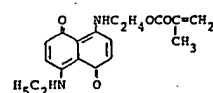
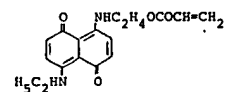
..... [XXIX]

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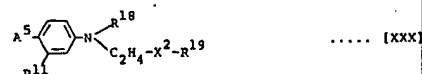
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wherein R¹⁸, R¹⁹ and X² are as defined above.

Examples of preferred naphthoquinone type dyes are those of the following structural formulae:

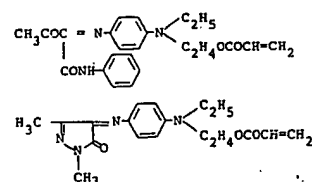


(vi) The aforesaid azomethine type dyes include azomethine type dyes of the general formula [XXX]:



wherein A⁵, R¹¹, R¹⁸, R¹⁹ and X² are as defined above.

Examples of preferred azomethine type dyes are those of the following structural formulae:



As the resin for preparing the above-described ink, that having a high melting point or softening point is suitable, and specific examples of suitable resins include phenolic resins, melamine resins, urethane resins, epoxy resins, silicone resins, urea resins, diallyl phthalate resins, alkyd resins, acetal resins, acrylic resins, methacrylic resins, polyester resins, starch and derivatives thereof, cellulosic resins, polyvinyl chloride, polyvinylidene chloride, fluorine resins, chlorinated polyethylene, polyethylene, polypropylene, polystyrene, polyvinyl acetal, polyvinyl alcohol, polycarbonates, polysulfones, polyether sulfones, polyethylene terephthalate, polybutylene terephthalate, polyphenylene oxide, polyphenylenesulfide, polyethylene naphthalate, polyacrylonitrile, polyimides, polyamides, AS resins, ABS resins etc.

Particularly preferred resins are such inert resins as methyl cellulose, polyvinyl alcohol, hydroxypropylmethyl cellulose, hydroxyethyl cellulose, polysulfones, polyether sulfones, polyethylene terephthalate, polycarbonates, ethyl cellulose, cellulose acetate, acrylic resins etc.

Examples of the solvent used for preparing the ink include alcohols such as methanol, ethanol, propanol, butanol etc., cellosolves such as methyl cellosolve, ethyl cellosolve etc., aromatics such as benzene, toluene, xylene, chlorobenzene etc., esters such as ethyl acetate, butyl acetate etc., ketones such as acetone, methyl ethyl ketone, methyl isobutyl ketone, cyclohexanone etc., hydrocarbons such as ligroline, cyclohexane, kerosene etc., chlorine type solvents such as chloroform, methylene chloride, trichloroethylene etc., dimethylformamide etc., and where a water-based resin is used, it is also possible to use water or water in mixture with the above-described solvents.

Particularly preferred solvents are such inert solvents as benzene, toluene, xylene, chlorobenzene, acetone, methyl ethyl ketone, chloroform, methylene chloride etc.

The base for the transfer sheet is suitably tissue paper such as condenser paper, glassin paper etc. or a film of a plastic having good heat resistance, such as polyesters, polyamides and polyimides. Such a base had to be thin in order to increase the heat transfer efficiency from the heat-sensitive head to the dye etc., and thus a thickness of not greater than 50 μm is suitable, preferably not greater than 20 μm.

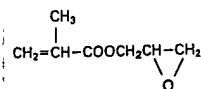
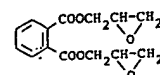
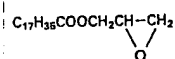
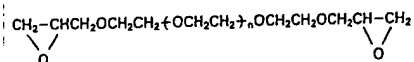
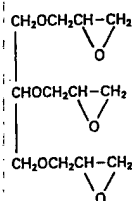
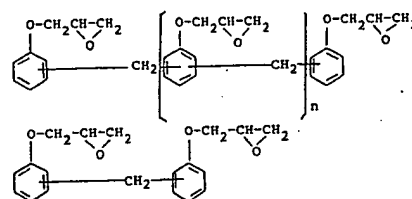
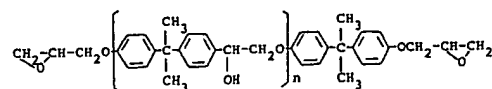
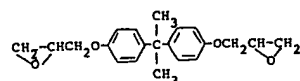
The recording sheet used in the transfer recording method of this invention may be obtained by coating an appropriate base, for example, paper, a resin film etc. with a coating solution containing a compound capable of reacting with the sublimable dye contained in the color material layer of the transfer sheet, and then drying to form an image receiving layer.

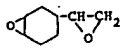
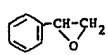
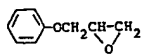


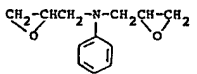

On that occasion, the coating solution may also contain a resin such as polyesters, polyamides, polyacrylates etc., inorganic fine particles such as silica, alumina, calcium carbonates etc., and the like. Examples of the compound capable of reacting with the sublimable dye contained in the color material layer of the transfer sheet include the following:-

(a) In the case where the sublimable dye contained in the color material layer of the transfer sheet is a sublimable dye capable of reacting with an epoxy group or an isocyanate group described in the aforesaid [A].

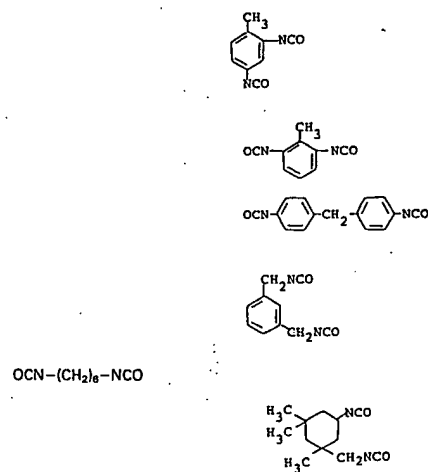
Compounds having an epoxy group, an isocyanate group or a blocked isocyanate group fall in this category.

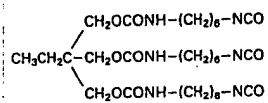
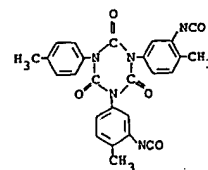
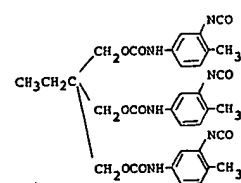
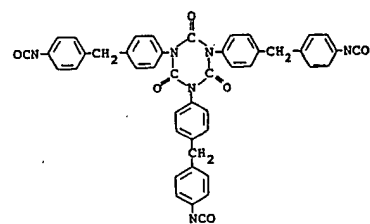
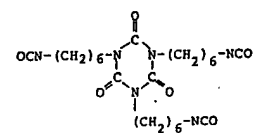
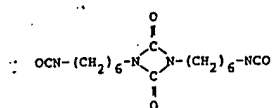
(i) The compounds having an epoxy group include various known polymers and monomers containing one or more epoxy groups, and specific examples thereof are those having the following structural formulae:

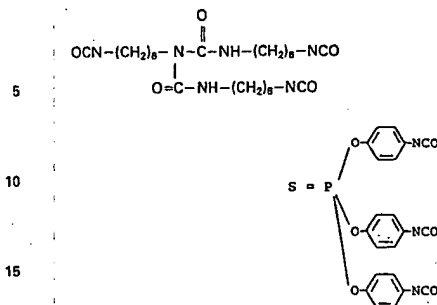


		
5		5
10		10
15	$\text{CH}_2=\text{CH}-\text{CH}_2-\text{OCH}_2\text{CH}-\text{CH}_2$ 	15
20	$\text{C}_6\text{H}_5\text{OCH}_2\text{CH}-\text{CH}_2$ 	20
25		25
30	$\text{R}-\text{CH}-\text{CH}_2$  (R = straight-chain alkyl)	30

(II) The compounds having an isocyanate group include various known isocyanate compounds, and specific examples thereof are those having the following structural formulae:





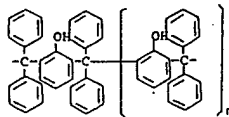
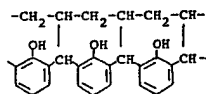
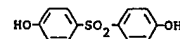
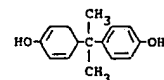


(iii) The compounds having a blocked isocyanate group include those which will produce an isocyanate group upon heating on heat transfer, and specific examples thereof include compounds obtained by inactivating (masking) the above-described isocyanate compounds with ethanol, phenol, cresol, diethyl malate, ethyl acetoacetate, acetylacetone etc.

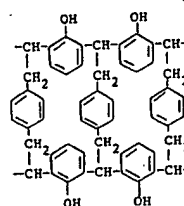
[b] In the case where the sublimable dye contained in the color material layer of the transfer sheet is the sublimable dye having a vinylsulfonyl group described in the aforesaid [B] or the sublimable dye having an acryloyl group or a methacryloyl group described in the aforesaid [D]:

Active hydrogen compounds fall in this category, and include various known polymers and low molecular weight compounds containing e.g. a hydroxyl group, a mercapto group, a carboxyl group, an amino group, a monoalkylamino group, or an amido group, preferably, a hydroxyl group, a carboxyl group or an amino group. Specific examples thereof are the following:

(i) Compounds having an OH group:



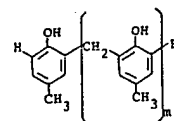
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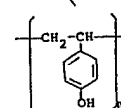
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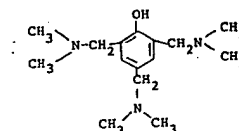
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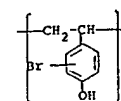
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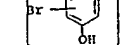
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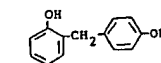
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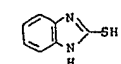
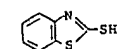
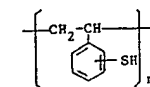
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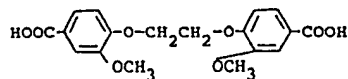
50 (ii) Compounds having a mercapto group:



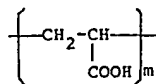
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(iii) Compounds having a carboxyl group:

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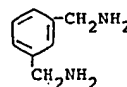
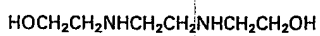
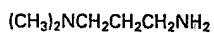
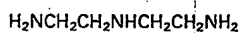
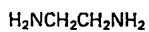
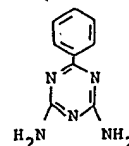
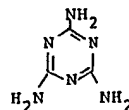
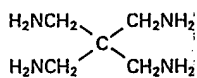
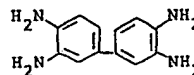
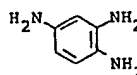
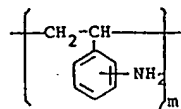
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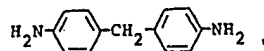
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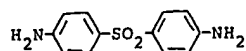
(iv) Compounds having an amino group, a monoalkyl group or an amido group:



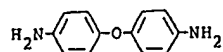
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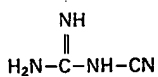


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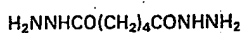
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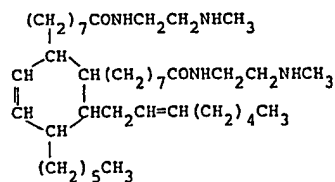
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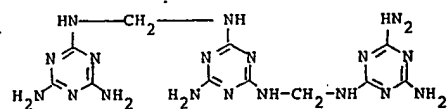
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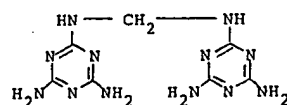
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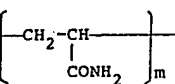
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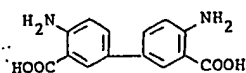
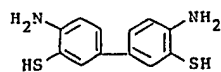
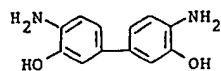


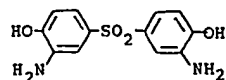
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(v) Compounds having various groups:





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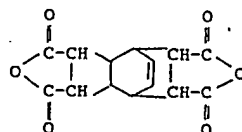
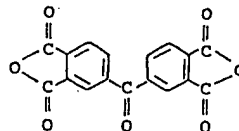
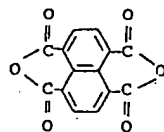
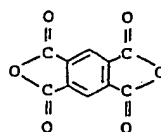
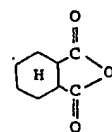
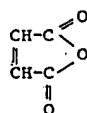
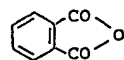
[c] In the case where the sublimable dye contained in the color material layer of the transfer sheet is the sublimable dye having an epoxy group described in the aforesaid [C]:

The active hydrogen compounds described in the aforesaid [b] or organic acid anhydride fall in this category.

10 Specific examples of organic acid anhydride include the following:

5

10



Heat-sensitive transfer recording using the transfer sheet and recording sheet obtained above may be effected by overlapping both in such way that the color material of the transfer sheet and the image receiving layer of the recording sheet be inside, and heating and pressing the assembly from the back side of the transfer sheet using a heat-sensitive recording head.

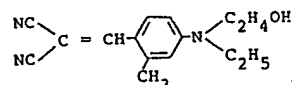
5 Where transfer recording is conducted by the above-described method, since the dye in the transfer sheet is not only sublimed and transferred to the recording sheet but also reacts with the compound capable of reacting therewith in the recording sheet, the fixation of the dye is ensured, thereby giving recording having excellent storage stability.

As evident from the preceding description and the examples described hereinbelow, recording having 10 excellent storage stability may be readily and simply obtained by this invention.

This invention is more particularly described by the following examples and preparation examples, but it will be noted that these examples are merely illustrative and do not restrict this invention.

Example 1

15 1) Process for the Preparation of a Transfer Sheet



20

Sublimable dye having the above structural formula

2 g

25

Ethyl cellulose

8 g

Isopropanol

90 g

Total

100 g

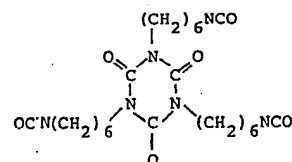
30

A mixture having the above composition was mixed and conditioned with glass beads using a paint conditioner for about 30 minutes to prepare an ink.

The above ink was coated on a condenser paper sheet (10 μm in thickness) using a gravure printer (30 μm in block depth) and thereafter dried in air to prepare a transfer sheet.

35

2) Process for the Preparation of a Recording Sheet



40

Isocyanate compound having the above structural formula

5 g

Polyester resin*

15 g

50

Methyl ethyl ketone

80 g

Total

100 g

55

* "VYLON 200" (tradename) produced by Toyo Spinning Co., Ltd.

The above composition was mixed to prepare a coating solution.

The above obtained coating solution was coated on a wood free paper sheet using a gravure printer (30 μm in block depth) and dried in air to prepare a recording sheet.

3) Method of transfer recording

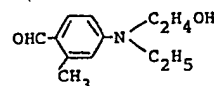
The aforesaid transfer sheet was overlapped with the recording sheet with the ink coated surface of the former and the coating solution coated surface of the latter inside, and heated from the back surface of the transfer sheet using a heat-sensitive head, thereby recording in a brilliant deep yellow color was successfully obtained on the recording sheet.

In order to test the stability of the recording thus obtained, the recorded surface was overlapped with a wood free paper sheet and maintained under pressure of 200 g/cm² at 80°C for 24 hours, and as a result, there was hardly observed any change in the color of the record or any staining on the wood free paper sheet due to the dye.

Reference example 1

(Synthesis of the Dye of Example 1)

62.1 g of a compound of the following structural formula:



was dissolved in 420 ml of IPA (isopropyl alcohol), 19.8 g of malonitrile and 1.5 ml of piperidine were added thereto, then the mixture was heated to 80°C and reacted at 80°C for 2 hours. After cooling, methanol was added, the precipitated crystals were filtered, washed with water and dried to obtain 62 g of yellow crystals. The obtained dye had a maximum absorption wavelength (λ_{max} : chloroform) of 448 nm.

25 Comparative example 1

1) Process for the Preparation of a Transfer Sheet A transfer sheet was prepared in a manner similar to that in Example 1.

2) Process for the Preparation of a Recording Sheet A coating solution was prepared by dissolving 15 g of a polyester resin (VYLON 200) in 85 g of methyl ethyl ketone, and coated on a wood free paper sheet in a manner similar to that in Example 1 to prepare a recording sheet.

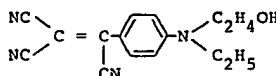
3) Method of transfer recording

The aforesaid transfer sheet and recording sheet were overlapped and transfer recording was conducted in a manner similar to that in Example 1 to obtain a record in a deep yellow color.

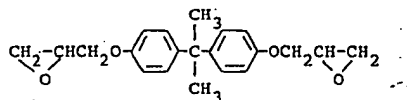
The thus obtained recording was tested for stability in a manner similar to that in Example 1, and, as a result, it was observed that the overlapped wood free paper sheet had been remarkably stained due to the migration of the dye from the recording sheet. Further, the color density of the recording sheet was remarkably reduced due to the migration of the dye.

40 Example 2

A transfer sheet was prepared by using a sublimable dye of the structural formula:



instead of the sublimable dye used in Example 1, and a recording sheet was prepared by using an epoxy compound of the structural formula:

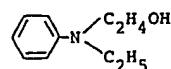


instead of the isocyanate compound used in Example 1, and thereafter transfer recording was conducted in a manner similar to that in Example 1 to obtain a record in a brilliant deep red color. This record was tested for stability in a manner similar to that in Example 1, and as a result, there was hardly observed any change in the color of the record or any staining of the wood free paper due to the dye.

*Reference example 2**(Synthesis of the dye of example 2)*

6.1 g of a compound of the structural formula:

5



5

was dissolved in 15 ml of N,N-dimethylformamide, then 3.8 g of tetracyanoethylene was gradually added thereto, and stirred at 40–50°C for 2 hours. After cooling, 100 ml of a 90% methanolic aqueous solution was added, and the precipitates were filtered off. They were washed with methanol and then with water, and dried to obtain 5.2 g of dark red crystals.

10

The obtained dye had a melting point of 162–168°C and a maximum absorption wavelength (λ_{max} : chloroform) of 521 nm.

15

Comparative example 2

Using the transfer sheet prepared in Example 2 and a recording sheet prepared in a manner similar to that in Example 2 except that the epoxy compound used in Example 2 was not used, transfer recording and a test on the recording stability were conducted similarly, and as a result, there were observed a remarkable reduction in the color density and remarkable staining of the overlapped paper due to the dye.

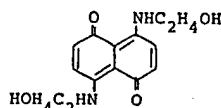
15

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Example 3

A transfer sheet was prepared by using a sublimable dye of the structural formula:

25



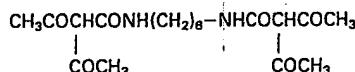
25

30

Instead of the sublimable dye used in Example 1, and a recording sheet was prepared by using a blocked isocyanate compound of the structural formula:

30

35



35

instead of the isocyanate compound used in Example 1, and thereafter transfer recording was conducted in a manner similar to that in Example 1 to obtain a record in a brilliant deep blue color. This record was tested for stability in a manner similar to that in Example 1, and as a result, there were hardly observed any change in the color of the record or any staining of the overlapped wood free paper sheet due to the dye.

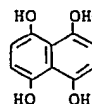
40

*Reference example 3**(Synthesis of the dye of example 3)*

Nitrogen gas was adequately blown into 90 ml of methanol, 30 g of a compound of the structural formula:

45

50



50

was added thereto, the mixture was cooled to 30°C or below, 2.10 g of hydroxyethylamine was added thereto and reacted at 40°C for 2 hours and then at 60°C for an hour, after which 90 ml of NMP (N-methylpyrrolidone) was added, the mixture was cooled to room temperature, and stirred at room temperature while slowly passing air for 5 hours thereby effecting oxidation. The precipitated crystals were filtered off to obtain 23.0 g of dark blue crystals.

55

The obtained dye had a maximum absorption wavelength (λ_{max} : chloroform) of 650 nm.

60

Comparative example 3

Using the transfer sheet prepared in Example 3 and a recording sheet prepared in a manner similar to that in Example 3 except that the blocked isocyanate compound was not used, transfer recording and a test on the recording stability were conducted, and as a result, there were observed a remarkable reduction in the color density and remarkable staining of the overlapped wood free paper sheet due to the dye.

60

65

Example 4

Using various sublimable dyes of the structural formulae set forth in Table 1 synthesized according to Reference Examples 1 - 3 instead of the sublimable dye used in Example 1, transfer sheets were prepared, and transfer recording was conducted in a manner similar to that in Example 1, thereby it was possible to obtain records having good stability, respectively.

5

Table 1

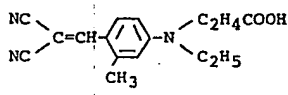
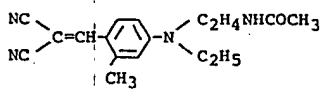
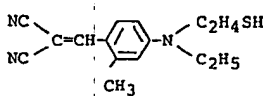
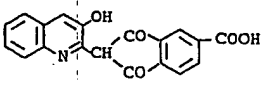
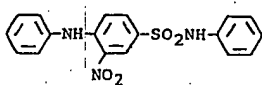
No.	Dye	Color of the Record	Max. Absorption Wavelength λ_{max} (chloroform) (nm)
1		Yellow	444
2		Yellow	446
3		Yellow	448
4		Yellow	448
5		Yellow	412

Table 1 (cont'd)

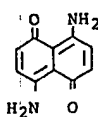
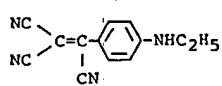
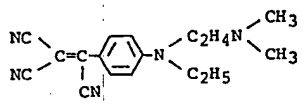
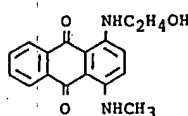
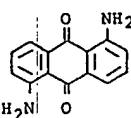
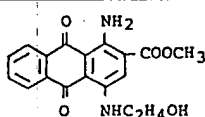
6		Blue	650
7		Yellow	505
8		Red	520
9		Blue	595
10		Red	540
11		Blue	671

Table 1 (cont'd)

12		Blue	625
13		Yellow	438
14		Red	496
15		Red	530
16		Red	515
17		Red	493

Table 1 (cont'd)

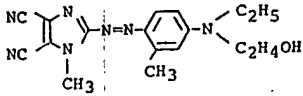
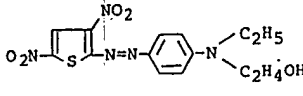
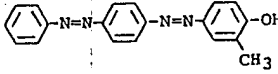
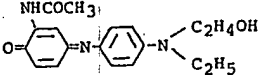
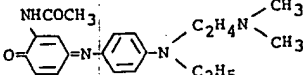
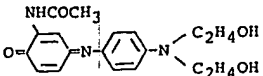
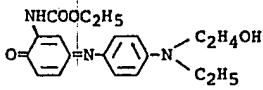
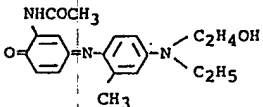
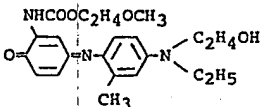
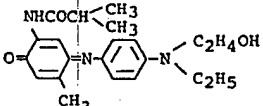
18		Red	521
19		Blue	643
20		Yellow	430
21		Blue	633
22		Blue	633
23		Blue	626

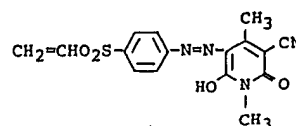
Table 1 (cont'd)

24		Blue	627
25		Blue	652
26		Blue	646
27		Blue	635

Example 5

A transfer sheet was prepared by using a sublimable dye of the structural formula:

5

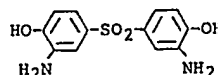


5

10

instead of the sublimable dye used in Example 1, and a recording sheet was prepared by using an active hydrogen compound of the structural formula:

15



15

instead of the isocyanate compound used in Example 1, and thereafter transfer recording was conducted in a manner similar to that in Example 1 to obtain a record in a brilliant deep yellow color. This record was tested for stability in a manner similar to that in Example 1, and as a result, there were hardly any change in the color of the record or any staining of the wood free paper sheet due to the dye.

20

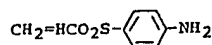
Reference example 4

(Synthesis of the dye of example 5)

25

1.83 g of the compound of the structural formula:

25

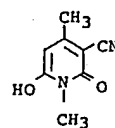


30

was suspended in 50 ml of water, dissolved therein by adding 4 ml of conc. hydrochloric acid and cooled, after which 0.83 g of sodium nitrite was added thereto and stirred at 0 - 5°C for 4 hours. This diazo solution was poured into a mixture of 1.64 g of a compound of the structural formula:

30

35



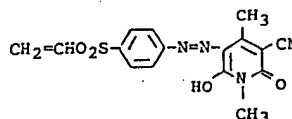
35

40

200 ml of methanol, 2 g of urea, 10 g of sodium acetate and 80 g of ice. The mixture was stirred until reaching room temperature, filtered, washed with water and dried to obtain a dye of the structural formula:

40

45



45

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(λ_{max} (chloroform): 445 nm)

50

Comparative example 4

Using the transfer sheet prepared in Example 5 and a recording sheet prepared in a manner similar to that in Example 5 except that the active hydrogen compound was not used, transfer recording and a test on the recording stability were conducted, and as a result, the overlapped wood free paper sheet was remarkably stained in a yellow color due to the migration of the dye from the recording sheet and also the color density of the recording sheet was remarkably reduced due to the migration of the dye.

55

Example 6

Transfer recording was conducted in a manner similar to that in Example 5 except that the dye used in Example 5 was replaced by various dyes of the structural formulae set forth in Table 2, thereby it was possible to obtain records having good storage stability, respectively.

Table 2

No.	Dye	Color of the Record	Max. Absorption Wavelength (λ_{\max}) (chloroform) (nm)
1	$\text{CH}_2=\text{CHO}_2\text{S}-\text{C}_6\text{H}_4-\text{N}=\text{N}-\text{C}_6\text{H}_3(\text{N}(\text{C}_2\text{H}_5)_2)$	Yellow	460
2	$\text{CH}_2=\text{CHO}_2\text{S}-\text{C}_6\text{H}_4-\text{N}=\text{N}-\text{C}_5\text{H}_3(\text{N}(\text{CH}_3)_2, \text{COOCH}_3, \text{OH})$	Yellow	420
3	$\text{CH}_2=\text{CHO}_2\text{S}-\text{C}_6\text{H}_4-\text{N}=\text{N}-\text{C}_5\text{H}_3(\text{N}(\text{CH}_3)_2, \text{CH}_3, \text{CN})$	Red	510
4	$\text{CH}_2=\text{CHO}_2\text{S}-\text{C}_6\text{H}_4-\text{N}=\text{N}-\text{C}_6\text{H}_3(\text{N}(\text{C}_2\text{H}_5)_2, \text{C}_2\text{H}_4\text{CN})$	Yellow	470
5	$\text{CH}_2=\text{CHO}_2\text{S}-\text{C}_6\text{H}_3(\text{CH}_3, \text{OCH}_3)-\text{N}=\text{N}-\text{C}_5\text{H}_3(\text{N}(\text{CH}_3)_2, \text{CH}_3, \text{CN})$	Red	519

Table 2 (cont'd)

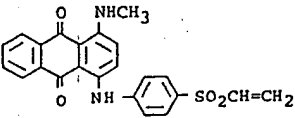
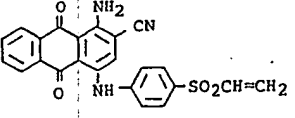
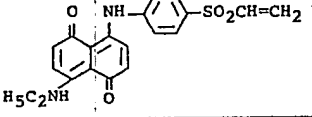
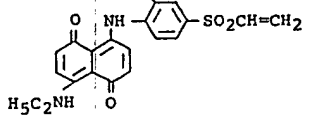
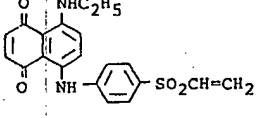
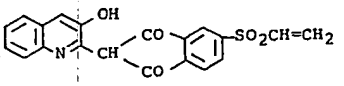
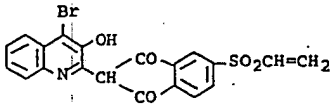
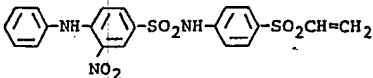
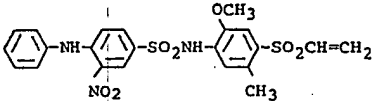
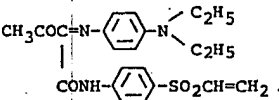
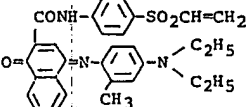
6		Blue	660
7		Blue	662
8		Blue	658
9		Blue	650
10		Blue	686
11		Yellow	446

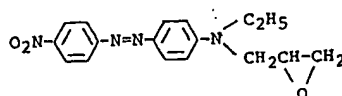
Table 2 (cont'd)

12		Yellow	448
13		Yellow	412
14		Yellow	413
15		Yellow	445
16		Blue	710

Example 7

Using a transfer sheet prepared by using a sublimable dye of the structural formula:

5



5

instead of the sublimable dye used in Example 1 and the recording sheet prepared in Example, transfer recording was conducted in a manner similar to that in Example 1 to obtain a record in a brilliant deep orange color. This record was tested for stability in a manner similar to that in Example 1, and as a result, there were hardly observed any change in the color of the record or any staining of the overlapped wood free paper sheet due to the dye.

10

15 Reference example 5

(Synthesis of the dye of example 7)

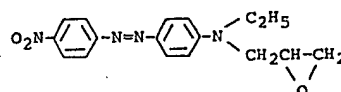
14 g of N-ethylaniline, 14.8 g of epichlorohydrin, 10 ml of water and 15 ml of ethanol were added, and reacted with stirring on a water bath for 3 hours. After cooling, the mixture was separated by a separatory funnel, and dried with sodium sulfate.

20 21g of the obtained N-ethyl-N-(2-oxy-3-chloropropyl)-aniline was cooled with ice during which 8 ml of a 50% sodium hydroxide aqueous solution was gradually added thereto with stirring. Thereafter, stirring was continued for 4 hours, the formed sodium chloride was filtered out, the organic layer was washed with water, and dehydrated with sodium sulfate.

20

25 The obtained N-ethyl-N-glycidylaniline and the diazo solution of p-nitroaniline were coupled to obtain a dye of the structural formula:

25



30

m. p. 159 – 162°C
Mass spectrum M+ 326
λ_{max} (chloroform) 474 nm

30

35 Comparative example 5

Using the transfer sheet prepared in Example 7 and a recording sheet prepared in a manner similar to that in Example 5 except that the active hydrogen compound was not used, transfer recording and a test on the recording stability were conducted, and as a result, the overlapped wood free paper sheet was remarkably stained in an orange color due to the migration of the dye from the recording sheet and also the color density of the recording sheet was remarkably reduced due to the migration of the dye.

35

40

Example 8

Transfer recording was conducted in a manner similar to that in Example 7 except that the dye used in Example 7 was replaced by various dyes of the structural formulae set forth in Table 3, thereby it was possible to obtain records having good storage stability, respectively.

45

Table 3

No.	Dye	Color of the Record	Max. Absorption Wavelength λ _{max} (chloroform) (nm)
1		Red	490
2		Blue	620

Table 3 (cont'd)

3	<chem>N#Nc1ccc(cc1N#Nc2cc(C#N)cc(C#N)c2)CCOCC</chem>	Blue	610
4	<chem>NCCOCCc1ccc2c(c1)C(=O)c3ccccc3C(=O)c2NCCOCC</chem>	Blue	650
5	<chem>CCOC(=O)c1ccc2c(c1)C(=O)c3ccccc3C(=O)c2NCCOCC</chem>	Blue	671
6	<chem>CCNc1ccc2c(c1)C(=O)c3ccccc3C(=O)c2NCCOCC</chem>	Blue	650
7	<chem>NCCOCCc1ccc2c(c1)C(=O)c3ccccc3C(=O)c2NCCOCC</chem>	Blue	684
8	<chem>NCCOCCc1ccc2c(c1)C(=O)c3ccccc3C(=O)c2NCCOCC</chem>	Yellow	445

Table 3 (cont'd)

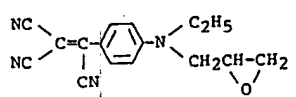
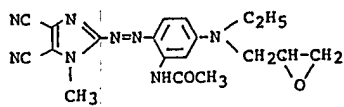
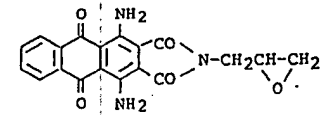
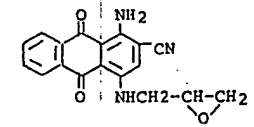
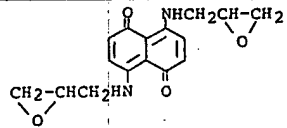
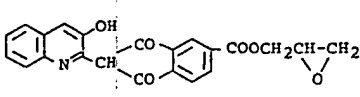
9		Red	520
10		Red	535
11		Blue	670
12		Blue	660
13		Blue	650
14		Yellow	446

Table 3 (cont'd)

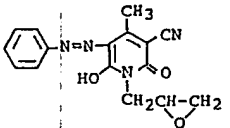
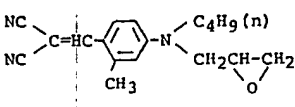
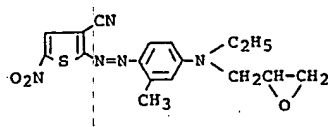
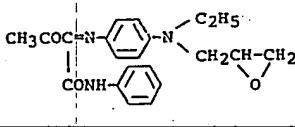
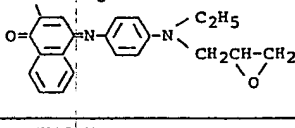
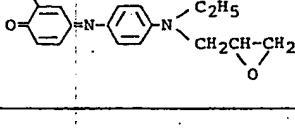
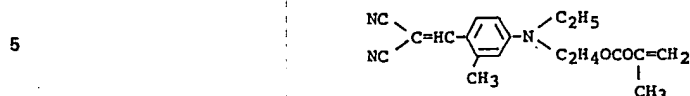
15		Yellow	440
16		Yellow	447
17		Blue	650
18		Yellow	445
19		Blue	690
20		Blue	635

Table 3 (cont'd)

21		Blue	629
22		Blue	654
23		Blue	629
24		Blue	655
25		Blue	626
26		Blue	647

Example 9

Using a transfer sheet prepared by using a sublimable dye of the structural formula:



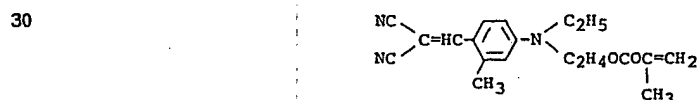
10 instead of the sublimable dye used in Example 1 and the recording sheet prepared in Example 5, transfer recording was conducted in a manner similar to that in Example 1 to obtain a record in a brilliant deep yellow color. This record was tested for stability in a manner similar to that in Example 1, and as a result, there was hardly observed any change in the color of the record or any staining of the wood free paper sheet due to the dye.

15 **Reference example 6**
(Synthesis of the dye of example 9)

2.55 g of a compound of the structural formula:



25 was dissolved in 100 ml of acetone, 1.21 g of triethylamine was added thereto and cooled with ice. Thereafter, 1.25 g of methacryloyl chloride was added dropwise thereto at 0°C, and, after completion of the addition, the mixture was stirred at the same temperature for 2 hours and then at room temperature for 2 hours. The reaction mixture was poured into 200 ml of ice water to precipitate crystals, which were then filtered off and dried to obtain a dye of the structural formula:



35 [λ_{max} (chloroform): 446 nm]

Comparative example 6

40 Using the transfer sheet prepared in Example 9 and a recording sheet prepared in a manner similar to that in Example 5 except that the active hydrogen compound was not used, transfer recording and a test on the record stability were conducted, and as a result, the overlapped wood free paper sheet was remarkably stained in a yellow color due to the migration of the dye from the recording sheet, and also the color density of the recording sheet was remarkably reduced due to the migration of the dye.

Example 10

Transfer recording was conducted in a manner similar to that in Example 9 except that the dye used in Example 9 was replaced by various dyes having the structural formulae set forth in Table 4, thereby it was possible to obtain records having good storage stability, respectively.

Table 4

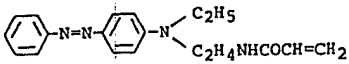
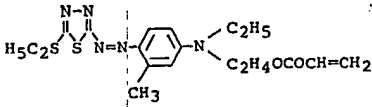
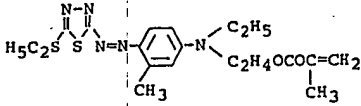
No.	Dye	Color of the Record	Max. Absorption Wavelength λ_{\max} (chloroform) (nm)
1		Yellow	420
2		Red	515
3		Red	515

Table 4 (cont'd)

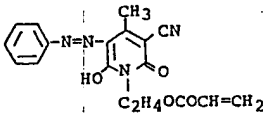
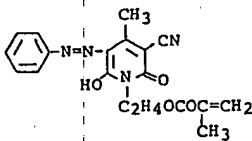
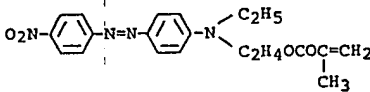
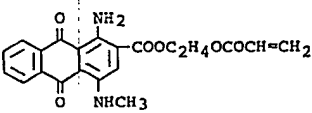
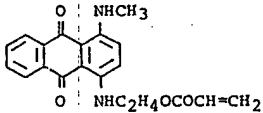
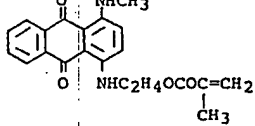
4		Yellow	440
5		Yellow	440
6		Yellow	473
7		Blue	671
8		Blue	653
9		Blue	653

Table 4 (cont'd)

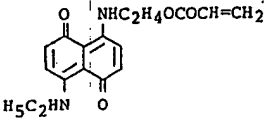
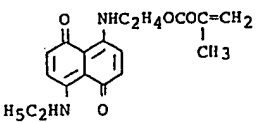
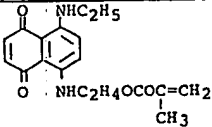
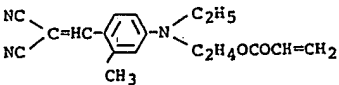
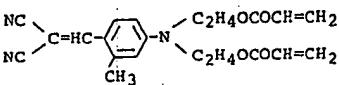
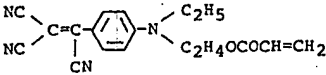
10		Blue	654
11		Blue	654
12		Blue	685
13		Yellow	446
14		Yellow	442
15		Red	520

Table 4 (cont'd)

16		Red	520
17		Red	521
18		Yellow	444
19		Blue	691
20		Blue	630
21		Blue	624

Table 4 (cont'd)

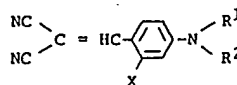
22		Blue	650
23		Blue	624
24		Blue	650
25		Blue	621
26		Blue	642

CLAIMS

1. A transfer recording system which comprises a transfer sheet having a color material layer containing a sublimable dye on a base which on heating according to image information received said sublimable dye is sublimed and transfer recorded on an image receiving layer of a recording sheet which image receiving layer contains a compound capable of reacting with the sublimable dye contained in the color material layer of the transfer sheet.

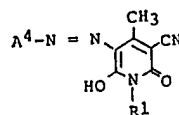
2. A transfer recording system according to Claim 1 wherein the sublimable dye has a group capable of reacting with an epoxy group or an isocyanate group and the image receiving layer contains a compound having an epoxy group, an isocyanate group or a block isocyanate group.

3. A transfer recording system according to Claim 2 wherein the sublimable dye is a styrylic dye of the formula:



wherein X is hydrogen or methyl, R¹ is hydroxyalkyl, dialkylaminoalkyl, hydroxycarbonylalkyl, acylaminoalkyl or mercaptoalkyl, and R² is alkyl or hydroxyalkyl.

4. A transfer recording system according to Claim 2 wherein the sublimable dye is an azo dye of the formula:



wherein A⁴ is optionally substituted phenyl, and R¹ is hydroxyalkyl, dialkylaminoalkyl, hydroxycarbonylalkyl, acylaminoalkyl or mercaptoalkyl.

5. A transfer recording system according to Claim 2 wherein the sublimable dye is an anthraquinone dye of the formula:



wherein R¹ is hydroxyalkyl, dialkylaminoalkyl, hydroxycarbonylalkyl, acrylaminoalkyl or mercaptoalkyl, and X⁴ is -O- or -S-.

6. A transfer recording system according to Claim 2 wherein the sublimable dye is a styrylic dye of the formula:



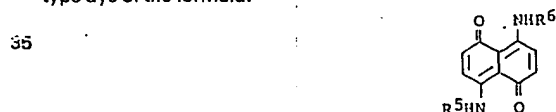
wherein R² is alkyl or hydroxyalkyl, and R³ is hydrogen, hydroxyalkyl or dialkylaminoalkyl.

7. A transfer recording system according to Claim 2 wherein the sublimable dye is an indoaniline type dye of the formula:



wherein n is 0 or 1, R² is alkyl or hydroxyalkyl, R³ is hydroxy, hydroxyalkyl or dialkylaminoalkyl, R⁴ is alkyl or alkoxyalkyl, and Y¹, Y² and X¹ are each hydrogen, methyl, methoxy, halogen, acylamino or alkoxy-carbonyl-amino.

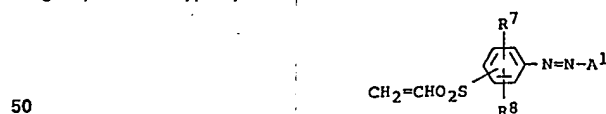
8. A transfer recording system according to Claim 2 wherein the sublimable dye is a naphthoquinone type dye of the formula:



wherein R⁵ is hydrogen, hydroxyalkyl or dialkylaminoalkyl, and R⁶ is hydrogen, alkyl, hydroxyalkyl or dialkylaminoalkyl.

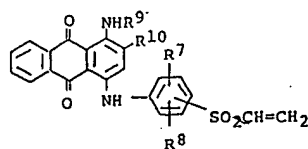
9. A transfer recording system according to Claim 1 wherein the sublimable dye has a vinylsulfonyl group and the image receiving layer contains an active hydrogen compound.

10. A transfer recording system according to Claim 9 wherein the sublimable dye having a vinylsulfonyl group is an azo type dye of the formula:



wherein A¹ is optionally substituted aminophenyl, pyrazolone, pyridone or pyridinyl, and R⁷ and R⁸ are each hydrogen, alkyl or alkoxy.

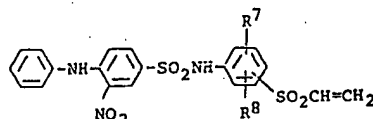
11. A transfer recording system according to Claim 9 wherein the sublimable dye having a vinylsulfonyl group is an anthraquinone type dye of the formula:



wherein R^7 and R^8 are each hydrogen, alkyl or alkoxy, R^9 is hydrogen or alkyl, and R^{10} is hydrogen or cyano.

12. A transfer recording system according to Claim 9 wherein the sublimable dye having a vinylsulfonyl group is a nitro type dye of the formula:

5



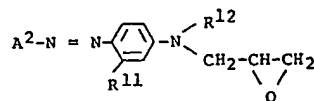
5

10 wherein R^7 and R^8 are each hydrogen, alkyl or alkoxy.

13. A transfer recording system according to Claim 1 wherein the sublimable dye has an epoxy group and the image receiving layer contains an active hydrogen compound or an organic acid anhydride.

14. A transfer recording system according to Claim 13 wherein the sublimable dye having an epoxy group is an azo type dye of the formula:

15



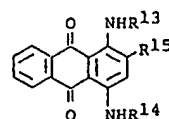
15

20

wherein A^2 is optionally substituted phenyl, benzothiazole, imidazole or thienyl, R^{11} is hydrogen, alkyl or alkylcarbonylamino, and R^{12} is alkyl.

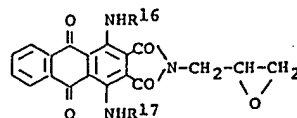
15. A transfer recording system according to Claim 13 wherein the sublimable dye having an epoxy group is an anthraquinone type dye of the formula:

25



25

30

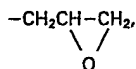


30

35

wherein R^{13} and R^{14} are each hydrogen, alkyl or

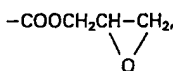
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40

R^{15} is hydrogen or

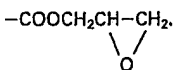
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45

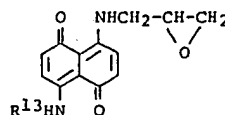
and R^{16} and R^{17} are each hydrogen or alkyl, with the proviso that when R^{13} and R^{14} are both hydrogen or alkyl, then R^{15} is

55

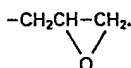


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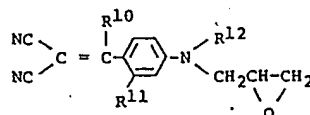
16. A transfer recording system according to Claim 13 wherein the sublimable dye having an epoxy group is a naphthoquinone type dye of the formula:



wherein R^{13} is hydrogen, alkyl or

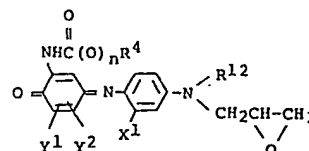


17. A transfer recording system according to Claim 13 wherein the sublimable dye having an epoxy group is a styrylic dye of the formula:



wherein R^{10} is hydrogen or cyano, R^{11} is hydrogen, alkyl or alkylcarbonylamino, and R^{12} is alkyl.

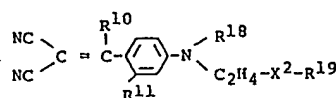
18. A transfer recording system according to Claim 13 wherein the sublimable dye having an epoxy group is an indoaniline type dye of the formula:



wherein n is 0 or 1, R^4 is alkyl or alkoxyalkyl, R^{12} is alkyl, and Y^1 , Y^2 and X^1 are each hydrogen, methyl, methoxy, halogen, acylamino or alkoxycarbonylamino.

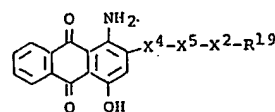
19. A transfer recording system according to Claim 1 wherein the sublimable dye has an acryloyl group or a methacryloyl group and the image receiving layer contains an active hydrogen compound.

20. A transfer recording system according to Claim 19 wherein the sublimable dye having an acryloyl group or a methacryloyl group is a styrylic dye of the formula:



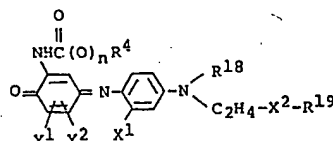
wherein R^{10} is hydrogen or cyano, R^{11} is hydrogen, alkyl or alkylcarbonylamino, R^{18} is alkyl, R^{19} is acryloyl or methacryloyl, and X^2 is $-O-$ or $-NH-$.

21. A transfer recording system according to Claim 19 wherein the sublimable dye having an acryloyl group or a methacryloyl group is an anthraquinone dye of the formula:



wherein X^4 is $-O-$ or $-S-$, X^5 is alkylene, X^2 is $-O-$ or $-NH-$, and R^{19} is acryloyl or methacryloyl.

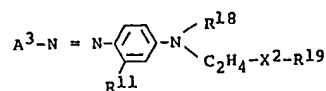
22. A transfer recording system according to Claim 19 wherein the sublimable dye having an acryloyl group or a methacryloyl group is an indoaniline type dye of the formula:



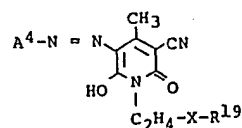
wherein n is 0 or 1, R⁴ is alkyl or alkoxyalkyl, R¹⁸ is alkyl, Y¹, Y² and X¹ are each hydrogen, methyl, methoxy, halogen, acylamino or alkoxycarbonylamino, R¹⁹ is acryloyl or methacryloyl, and X² is -O- or -NH-.

23. A transfer recording system according to Claim 19 wherein the sublimable dye having an acryloyl group or a methacryloyl group is an azo dye of the formula:

5



10



15

wherein A³ is optionally substituted phenyl, benzothiazole, imidazole, thiadiazole or thienyl, A⁴ is optionally substituted phenyl, R¹¹ is hydrogen, alkyl or alkylcarbonylamino, R¹⁸ is alkyl, R¹⁹ is acryloyl or methacryloyl, and X² is -O- or -NH-.

20

24. A transfer recording system according to any one of claims 1 to 23 which comprises a heat sensitive sheet set comprising said transfer sheet and said recording sheet.

25. A heat-sensitive transfer recording system comprising sheet set which comprises a transfer sheet provided with a color material layer containing a sublimable dye, and a recording sheet having an image receiving layer capable of undergoing a covalent bond reaction with said subliming dye by heating said transfer sheet according to the image information received.

25

26. A transfer recording system substantially as hereinbefore specifically described.

27. A method of transfer recording wherein a system according to any one of claims 1 to 25 is heated according to information received.

30

28. A transfer sheet for use in a transfer recording system as claimed in any one of claims 1 to 26 and having a color material layer as described in any one of claims 1 to 26.

29. A recording sheet for use in a transfer recording system as claimed in any one of claims 1 to 26 and having an image receiving layer as described in any one of claims 1 to 26.

30